

**Witness Testimony of Susan Shore, Ph.D., Chair, Scientific Advisory Board
American Tinnitus Association**

**House Committee on Veterans Affairs, Subcommittee on Health
Legislative Hearing on H.R. 1443, The Tinnitus Research and Treatment Act of 2013
July 9, 2013**

Good morning Chairman Benishek, Ranking Member Brownley, and distinguished members of the Health Subcommittee. My name is Dr. Susan Shore, and I am the Chair of the Scientific Advisory Committee of the American Tinnitus Association. Thank you for holding this important hearing on an issue of concern to our nation's armed forces and those members returning from combat – Tin-night-us or tinn-it-us, most commonly referred to as “ringing in the ears.” Tinnitus has long been called the “invisible injury,” so because of this, and many other reasons which I will be addressing, it is extremely relevant and timely that tinnitus is recognized as a mandatory condition for research and treatment by the Department of Veterans Affairs. On behalf of the American Tinnitus Association and the 50 million Americans afflicted with tinnitus I appreciate the opportunity to speak to you today and respectfully urge your support for H.R. 1443, the Tinnitus Research and Treatment Act of 2013.

The American Tinnitus Association focuses on curing tinnitus through the development of resources that advance tinnitus research. Founded in 1971, ATA is the only member-based and supported, national non-profit organization, dedicated to finding a cure for tinnitus. Since 1980 we have funded grants toward better understanding the mechanisms responsible for and underlying the genesis of tinnitus. Our Scientific Advisory Committee, comprised of 17 tinnitus investigators from multiple disciplines across the U.S., conduct peer reviews of all the grant proposals received at ATA. The most meritorious proposals with promise to help us get to that cure, are then forwarded to members of our Board of Directors who make the final funding decisions on these grants.

The advances in tinnitus research over the past decade have been extraordinary. Many researchers across the country are breaking down barriers as I speak, in their own laboratories. One of the most important advances through research in recent years is the ability to “visualize” tinnitus, through the use of advanced functional imaging technologies and through the development of animal models that can behaviorally assess the presence of tinnitus. These methods allow us to pinpoint tinnitus to certain regions of the brain. Another important advancement that has occurred mainly

through the use of animal models is the discovery that tinnitus is a result of brain plasticity that occurs in response to outside insults such as noise damage or head and neck injury. In layman's terms, brain plasticity refers to the ability of neurons in the brain to change their responsiveness and connectivity in the face of environmental influences. These developments have led the scientific community to understand that tinnitus is a disorder of brain function.

For decades, tinnitus was thought of as a disease of the ear, or simply a symptom of hearing loss. Because of research we now know that in most instances, tinnitus does not originate in the ear but rather in the brain. And we also know that you do not need to have a measurable hearing loss in order to have tinnitus. While noise overexposure is still the number one cause of tinnitus, it can also develop in the absence of hearing damage as the result of a head or neck injury. So, while the relationship between hearing loss and tinnitus is high, we still do not understand well why some people with hearing loss develop tinnitus and others do not. This is an important area of research for both human and animal models because if we understand why certain vulnerabilities exist, we can come up with more appropriate treatments.

Tinnitus also does not discriminate. It can happen to anyone at any time. 50 million Americans experience tinnitus and of those, 16 million seek medical attention for recurrent or chronic tinnitus. Two to three million are completely debilitated from their tinnitus rendering them unable to work, interact with family and friends, or sometimes even leave their home, degrading their quality of life. In addition to tinnitus, these people often have feelings of anxiety, depression and loneliness which can be directly attributed to their condition. Research has uncovered that depression and anxiety are comorbid conditions with tinnitus and may be part of the brain circuitry that is misdirected in bothersome tinnitus.

Specific groups of people are disproportionately impacted by tinnitus. These groups include, factory workers, police officers and firefighters, emergency medical technicians, musicians, and, the reason we are here today – our military personnel and veterans.

Tinnitus is the **number one service-connected disability** for returning veterans from Iraq and Afghanistan. As I mentioned before, in addition to hearing loss, head and neck injury can also contribute to tinnitus. So while tinnitus in these veterans is most often the result of extreme noise exposure from either a single impulse noise or the accumulation of noise exposure, **head and neck injury is also a leading complaint of these veterans**. In fact, lumbosacral or cervical strain account for 23% of service-

connected disabilities for Iraq and Afghanistan veterans as of July 2009. In addition to factors that cause hearing loss, such as noise over-exposure, the generation and maintenance of tinnitus can occur as a result of temporal-mandibular joint disorder, or somatic insults, including lumbosacral or cervical strain. Research into how these systems interact in the brain has the potential to lead to treatments such as tailored devices that aim to ameliorate aberrant brain circuitries resulting from a combination of hearing loss and head and neck injuries.

Since 2006, service-connected disability payments to veterans from all periods of service for tinnitus, has been increasing at a rate of 15% per year. In 2012, the VA paid out \$1.5 billion in disability compensation to over 971,000 veterans for tinnitus alone. At the current rate of increase the cost will exceed \$3 billion annually by 2017. This dollar amount does not take into account the extreme suffering and necessary clinical care for veterans with tinnitus or the economic loss to society for those who are unable to work as a result of their tinnitus.

When you consider that cost, in comparison to what is being spent on tinnitus research in the U.S., there is a severe disconnect. Up until very recently the amount of money being spent on tinnitus research has been negligible. At the end of 2012, between all public and private funding in the U.S., approximately \$10 million was spent on funding research toward a tinnitus cure. Though still a small number, this is up from a mere \$1.5 million in 2005, and that increase has been all due to Congressional interest in this matter.

What have we learned as a result of recent increased research on tinnitus? And where do we need to go from here?

- It is now well-established that alterations in neural plasticity in distinct parts of the brain are changed in patient and animal models of tinnitus. This opens the way for stimulation treatments that alter the aberrant neural circuitry. Some examples of this are special devices that provide tailored auditory-somatosensory or vagal nerve stimulation with the aim of returning the circuits to a normal state.
- Other treatments aim to target changes in the molecular environment with targeted drug therapies but at present there is no drug treatment that is specific to tinnitus.
- The involvement of non-auditory systems in tinnitus is increasingly becoming apparent through animal and human tinnitus experimental models.

Understanding these interactions in the brain is crucial for the development of treatments for alleviating this often debilitating condition.

Several studies have been conducted by both the Department of Defense and the Department of Veterans Affairs as a result of the growing need to address tinnitus in the military. Those studies directly connect tinnitus as co-morbidity to both Traumatic Brain injury and Post Traumatic Stress Disorder as well as indicate that tinnitus is a larger problem than hearing loss in the blast exposed population. This is why our organization has advocated for the inclusion of tinnitus as a research condition in tandem with both TBI and PTSD.

In particular, mild Traumatic Brain Injury or mTBI often includes tinnitus as a manifestation of injury. mTBI as defined by the Department of Defense Policy for Mild Traumatic Brain Injury is the presence of a documented head trauma or blast exposure event, followed by a change in mental status which could include nausea, dizziness/balance problems, temporary headache, sensitivity to noise or lights, vomiting, fatigue, insomnia and sleep disturbances, drowsiness, blurred vision, memory problems, poor concentration and tinnitus. A recent DoD study on Iraq veterans exposed to blast indicated that 70% of those exposed to blast reported tinnitus within the first 72 hours after the incident. 43% of those seen one-month after exposure to blast continued to report tinnitus. While the rate decreases over time, tinnitus rates exceeded hearing loss rates at all the time points. These findings also demonstrate the need for more comprehensive diagnostics and broader range of therapeutic approaches for tinnitus which can only be achieved by continued and additional research on the condition.

There have been some important bipartisan legislative steps taken by Congress in recent years to address the growing problem of tinnitus in veterans and active duty military personnel, including the addition of tinnitus as a researchable condition in the DoD Congressionally Directed Medical Research Program. The American Tinnitus Association applauds these efforts, and we very much appreciate the efforts of the Department of Veterans Affairs through the Portland VA Medical Center's National Center for Rehabilitative Auditory Research (NCRAR) to support tinnitus treatment. At the same time, we respectfully believe that tinnitus, which is so often associated with both TBI and PTSD deserves additional scrutiny. Improving tinnitus treatment with the goal of curing this disorder will almost assuredly impact treatment modalities for these other invisible wounds of war.

Through passage of legislation such as H.R. 1443, the lives of veterans will be improved. And every research dollar spent, each discovery, and every step toward a cure for tinnitus benefits all Americans who suffer with this disorder."

I would like to close by sharing with you an email (one of hundreds I receive) that exemplifies the impact of research in the life of a veteran:

"Dear Dr. Shore

Like many vets I have suffered from tinnitus ever since I was exposed through my line of work during the four years I served in the USAF servicing F-4 Phantom Jets from 1966 to 1970. They had massive engines running nearby and ear protection was often lacking or in need of repair. My ears would often ring after work but after a few years began to ring more often until, as now, they ring 24-7. It is now to the point of changing much of my life through constant use of masking devices, insomnia and general aggravation. The VA will sometimes allow a very small 10% disability for tinnitus but has made it very difficult and time consuming to all but those who can afford an attorney to represent them. That level of disability amounts to a small pittance of about 100 bucks a month but can be helpful with hearing aids later in life.

However, I did file a claim with the VA which after many, many months was denied, the reason being according to their reviewing officer is that although I have some reduction in hearing (and had a reduction from my initial entrance to my discharge exam) it's not enough under VA standards PLUS they stand by statement quoted from and publication called the NOISE MANUAL (Fifth Edition, Berger, AIHA Press 2000, P125) "only seldom does noise cause a permanent tinnitus without also causing hearing loss". Aside from the fact that "hearing loss" is an arbitrary term and by the VA standard I have none, I am living proof that this statement is not always true and is not a valid criteria for denial of claims. Thank you greatly for your time and for your research into what has become for me a lifelong constant aggravation.

Yours sincerely, DCS"

This patient is correct in that tinnitus does not always have to occur in the presence of hearing loss detectable by conventional clinical methods. However recent research has indicated that more extensive hearing tests than are performed in the clinic may unveil hidden abnormality in the auditory system that may contribute to the brain plasticity underlying tinnitus. Even conventional hearing tests indicate that up to 19% of adolescents in the United States show evidence of mild hearing impairment caused by exposure to loud environmental and recreational sounds. Because peripheral hearing damage tends to worsen over the years, tinnitus is a looming public health

challenge for citizens of all ages as well as a major disability affecting thousands of veterans in our armed forces.

Thank you again for the opportunity to be here and bring attention to tinnitus, a condition that has been far too long neglected. Passage of legislation such as H.R. 1443 will go a long way to helping us achieve our goals of improving tinnitus treatment and ultimately, finding a cure for this disorder. ATA is happy to provide any additional technical information on existing tinnitus research efforts as well as our suggestions for future activities, as embodied in the ATA “Roadmap” which is included as an addendum to my testimony.



ATA's Roadmap to a Cure

